LOCKHEED VP DETAILS SST DEVELOPMENT PROBLEMS

A technological foundation for the development of a Mach 2.5 to 3.0 commercial supersonic transport is presently non-existent at the vendor and equipment level of the aircraft industry, C. L. "Kelly" Johnson told an AIAA sponsored three-nation aircraft design and technology meeting in Los Angeles. Johnson, v.p.-advanced development projects at Lockheed Aircraft Co., stressed "a great need" for a concerted industry-wide effort in the development of all types of materials and equipment for such an aircraft and proceeded to list nineteen specific tasks.

Acknowledging that "they may seem quite detailed for a meeting of this type," Johnson nonetheless insisted they reflected costly and difficult development problems which, while solved to an acceptable degree for specialized military aircraft, required the concentration of the industry as a whole if a supersonic transport is to have acceptable reliability and operating economy.

The Kelly Johnson list of SST development problems pinpoints the following:-

(1) A fuel tank sealant able to accept metal temperatures of -90 degrees to +600 degrees F., retain flexibility sufficient to account for the structural flexing encountered at all attitudes and which can live under a nitrogen inerting gas blanket.

(2) Electric wiring that can take the nacelle environment of high temperatures (800 to 1200 degrees F.) and vibration, particularly during such rough conditions as exist when the inlet shock pops or the engine malfunctions.

(3) Electric plug connectors and switches to meet these conditions and which evidence greatly improved mechanical design.

(4) Better uniformity in high temperature metals with less notch sensitivity.

(5) Finished extrusions in titanium that do not require further machining and at current costs of $20.00 per ft. or more.

(6) Extremely large forgings, both for engine and airframe parts, to eliminate complex and expensive built-up sections.

(7) Machine tools with multiple spindles for profiling which are no less than three times as stiff and having five to ten times the power of existing types used to cut aluminum alloys.

(8) More sophisticated design in ground equipment. (Johnson obviously feels strongly about this one. He classes existing such equipment as "primitive" and suggests one design requirement should be that "the equipment designer spend one month in a hangar where his noisy, clumsy equipment continues to squeal, growl, burp, leak and groan for hours at a time to the detriment of all personnel within 500 ft. of it during aircraft check out and test!)

(9) A cheaper fuel with good thermal stability, up to 600 degrees F. at high pressure and low vapor pressure (2 to 3 psi) at 300 degrees F. when used for a heat sink to cool the aircraft components and cabin.

(10) An engine oil which doesn't require dilution at temperatures below plus 40 degrees F. but which can safely take the high temperatures in flight and after engine shut down.

(11) A whole new field of engine and aircraft instrumentation, particularly pressure transducers and thermocouples that can live in the tough environment of sustained Mach 3 flight.

(12) High pressure hydraulic plumbing fittings which don't cost $30 to $60 each for a three-quarter inch line, with more foolproof features for assembly and daily use.

(13) Electrical equipment that can take high altitude and temperatures.

(14) Better greases for high temperature use.

(15) Coatings for titanium bolts and shafts that allow them to rotate (on anything!) without seizing. (Johnson notes that millions of dollars have been spent, unsuccessfully to date, on this problem by many competent organizations and suggests changes in basic titanium metallurgy may be the best approach to a solution.)

(16) Tires able to withstand prolonged exposure to high temperatures while retracted in the wheel wells.

(17) Cockpit and cabin cooling systems designed as critical safety elements and not normal accessories.